Inward foreign direct investment and aggregate imports: time series evidence from Pakistan

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Abstract

This study investigates the impact of inward foreign direct investment (*FDI*) on aggregate imports in Pakistan using the annual time series data for the period 1981 to 2007. The cointegration results suggest that there exists a unique significant positive long-run equilibrium relationship between inward *FDI* and aggregate imports in Pakistan. The respective parsimonious short-term dynamic error-correction model also confirms a significant positive short run relationship with high speed of adjustment. The causality result shows unidirectional causality running from inward *FDI* to aggregate imports in the country. The sensitivity analysis confirms that the results are robust. The implication of the study is that to lesson the negative impacts of inward *FDI* only those types of foreign investment should be attracted that has small import contents in their production process.

JEL Classification Code: C22, F10, F21

Key Words: Inward *FDI*, Imports, Cointegration, Causality

Inward Foreign Direct Investment and Aggregate Imports:

Time Series Evidence from Pakistan

1. Introduction

Historically, the benefits and costs of inward foreign direct investment (*FDI*) has been a matter of fierce controversy. On the one hand, it is encouraged due to transfer of technology, expansion of trade, creation of jobs and promotion of economic development and integration of global market. On the other hand, it is opposed because it is supposed to create balance of payments problems, permitting exploitation of the host country's market, and reducing the host country's ability to manage its economy.

In recent years, the focus of research is the impact of inward *FD*I on host country's imports. Theoretically, either relationship (positive or negative) between inward *FDI* and aggregate imports may exist. When, for instance, *FDI* entails producing products abroad that were previously exported from the investing country, the inflows of *FDI* and imports in the recipient economy are expected to be substitutes. If, instead, the motivation for *FDI* is to benefit from factor productivity and remuneration differentials across countries, a rise in inward *FDI* will probably be accompanied by an increased demand for inputs and intermediate goods. This input requirement will be fulfilled through imports. In this case *FDI* and host countries import will be complement.

But it should be cleared that, for many of the same reasons; it is no easier to determine a priori the relationship between inward *FDI* and host-country import. Again, the question of the

relationship between inward *FDI* and imports can be settled only by looking at the empirical evidence. Thus, in this paper, we will try to shed new light on the empirical relevance of inward foreign direct investment on host country's imports by examining this relationship for Pakistan economy.

The rest of the paper is organized as follows. Section 2 reviews the empirical literature on the relationship between *FDI* inflows and imports. Section 3 discusses the modeling framework for empirical examination of the relationship. Section 4 shows the estimation results of cointegration and error correction model. Section 5 tests the direction of causality between the variables of the model. Section 6 performs simple sensitivity analysis to check the robustness of the initial results. Final section concludes the study and provides some policy implications.

2. Review of Literature

Most of the empirical research suggests that inward *FDI* tends to increase the host country's imports. One reason is that *FDI* often have a high propensity to import intermediate inputs, capital goods and services that are not readily available in the host countries. Concerns about the quality or reliability of local supplies of inputs can also be a factor.

Lin (1995), estimates import demand equations for Taiwan augmented with an inward *FDI* from four countries, Indonesia, Malaysia, Philippine and Thailand, for the period 1972 to 1992. The current inward *FDI* showed no effects on Taiwan's imports from the home country because the sign of inward *FDI* variable was mostly positive but statistically insignificant. The exception is the effect of inward *FDI* on imports from Thailand. The significant negative sign was observed in that case, which may reflect some degree of import displacement by *FDI*.

de Mello and Fukasaku (2000), analyze the linkage between foreign trade and *FDI* in selected Latin American and South East Asian countries[1] between 1970 to 1994 by means of bi-variate vector error-correction models and causality analysis. The complimentarily hypothesis between *FDI* and import was confirmed for all countries in Latin America with the Exception of Mexico, for which *FDI* seems to be displacing imports in the long run. In the case of South East Asia complimentarily hypothesis was confirmed for most countries with the exception of Philippine and Singapore. The study accepts that the conclusion on the import-*FDI* nexus is less clear cut.

Liu *et al*. (2002) investigates the causal link between trade, economic growth and inward foreign direct investment in China at the aggregate level. The study uses the quarterly data from 1981:1 to 1997:4 and test the cointegration and causality between growth, export, import and *FDI* using a full vector autoregressive error correction mechanism. The study finds the existence of a substitution effect between *FD*I and import in China during the period under study. They also find one way causal link running from *FDI* to imports in the country.

Alguacil and Orts (2003) investigate the link between inward *FDI* and imports in Spain. Their findings show that in imports demand function not only relative prices and domestic demand are significant but also *FDI* inflows appear to be positively related to this variable in the long run, which suggest a complementary relationship. Concerning the direction of these effects, the dynamic behavior of variables to external shocks indicates the existence of a unidirectional causality, in the Granger sense, running from *FDI* to imports. In fact, imports seem to be very sensitive to unexpected movements of foreign investments, particularly during the first years.

[1] These countries were Argentina, Bolivia, Brazil, chili, Colombia, Ecuador, Mexico, Peru, Uruguay, Venezuela, Indonesia, South Korea, Thailand, Malaysia, Philippine and Singapore.

However, the evidence does not find any support for a reverse sequence going from imports to *FDI*, indicating that the opposite causation dominates.

Many studies have investigated the relationship between Pakistan's inward *FDI* and other aspects of Pakistan economy. Previous research in this area falls roughly into two groups. The first group of studies tests the main determinants of inward *FDI* in Pakistan using time series or panel data. Papers in second groups examine the effects of *FDI* on economic growth and international trade. A brief review of these studies is presented in the following paragraphs.

Shah and Ahmed (2003) investigate the determinants of *FDI* in Pakistan by using time series data during the period 1960 to 2000. They use cointegration and error correction model to identify the long run and short run determinants of *FDI* in the country. The results show that cost of capital for foreign firm, *GNP* per capita, change in real *GDP*, tariff rate, real expenditure on transport and communication by public sector and dummy for democratic government, all are significant determinants of *FDI* in the long run. While, *GNP* per capita, tariff and dummy for drastic increase in *FDI* flows during the year 1995-96 prove their significant effect in the short run.

Ahmed, Alam and Butt (2003) examine the effect of openness in Pakistan economy by considering the trade and *FDI* relationship using time series data during the period from 1972 to 2001. They discuss that increasing international trade (export and imports) is not only indicator of openness but also foreign direct investment. They argue that no study has been done to test the existence of any causal relationship between *FDI*, exports and domestic output using Toda and Yamamoto test[2] over these period. The results indicate that there is a long run

[2] This is Granger non causality procedure developed by Toda and Yamamoto (1995).

relation between *FDI*, exports and domestic output. They suggest that Pakistan outward looking development strategy should include *FD*I as an essential element in addition to export promotion strategy.

Aqeel and Nishat (2004) empirically identify the effectiveness of government policies to attract *FDI* during 1961 to 2003. In this study cointegration and error correction techniques have been applied to identify the variables that attract *FDI* in Pakistan. They consider *GDP*, average wage, corporate tax, custom duties, credit to private sector, average annual exchange rate and general share price index and two dummy variables.[3] All variables were statistically significant except wage rate and share price index in both long run and short run models. They suggest that policy makers should use these variables to attract *FDI* in Pakistan.

Atique, Ahmed and Azhar (2004) empirically examine the impact of *FDI* on economic growth of Pakistan over the period 1971 to 2001. They claim that there is no study to check "Bhagwati Hypothesis[4]" in case of Pakistan. The results indicate that *FDI* has constructive impact on economic growth and played an important role in export promotion strategy. Thus, these results support the Bhagwati Hypothesis in case of Pakistan.

Khan (2007) examines the connection between *FDI*, domestic financial sector, and economic growth for Pakistan over the period 1972–2005. Empirical investigation is based on the bound testing approach of cointegration advanced by Pesaran, et al. (2001). The results of the study indicate that *FDI* inflows have positive effect on economic growth in the short-run and long-run if the domestic financial system has attained a certain minimum level of development. The study

[3] $Dummy_1$ takes the value of 1 for 1972 and onward for devaluation and $Dummy_2$ takes the value of 1 for 1989 and onward for structural reform.

[4] According to this hypothesis the gain from *FDI* is less under import substitution compared to export promotion regime. Also see Balasubramanyam, *et al* (1996).

concludes that better domestic financial conditions not only attract foreign companies to invest in Pakistan, but also allow maximizing the benefits of foreign investment.

Yousuf, Hussain and Nisar (2008) highlight the impact of *FDI* on exports and imports of Pakistan during the period 1973 to 2004. The error correction model result shows that *FDI* has positive impact on real imports and negative impact on real exports in the short run. The cointegration results suggest that *FDI* has positive impact on real exports and real imports in the long run. They suggest that policy makers should provide pleasant environment to attract *FDI* for the transfer of technology to the host country. However, they did not perform any causality analysis to test the direction of causality between *FDI* and imports. Furthermore, the sensitivity analysis has not been done to check the robustness of the results.

3. Modeling Framework

Theoretically, there are two approaches to estimate aggregate import demand function. In the first approach, import demand is a function of real income and relative price. The expected sign of real income is positive and relative price is negative. The second approach is split-price condition in place of the price ratio. This relates changes in quantity of imports to changes in income and price separately. Thus, a growth in domestic income will lead to a greater demand for imports. Conversely, an increase in foreign goods prices in relation to domestic prices will exert a negative influence on import. Furthermore, as recently argued in the literature of trade and *FDI*, the demand for imports might be affected by *FDI*. However, the influence (positive or negative) of this variable on imports is far from being unambiguous from a theoretical and empirical point of view.

In accordance with the above arguments, the long-run equation for imports (*IMP*) may be expressed as function of the level of domestic income *(GDP),* the relative price of imports (*REP*), and inflows of foreign direct investment (*FDI*). That is,

$$IMP = f(GDP, REP, FDI) \qquad (3.1)$$

Sarmad (1989) and Dutta and Ahmed (1999) considered real foreign exchange reserve *(FER)* as a determinant of import demand. Alguacil and Orts (2003) also used political instability (*INS*) in their import demand function. Economic theory does not provide a guideline about the impact of some variable like workers' remittances *(REM),* gross fixed capital formation *(GCF),* and gross fixed capital formation in industrial *(ICF)* and gross fixed capital formation in manufacturing *(MCF)* on import demand. In this study, all these additional variables will also be used for sensitivity analysis.

Economic theory does not provide any specific criteria to select functional form for import demand**.** Khan (1974) discusses that two functional forms have been most commonly used for import demand are either linear or log-linear formulation. Log-linear form has been used in this study as in such model import demand function shows proportional reaction of import to increase and decrease in the explanatory variables. In this study, we use log-linear form for the import demand function.

4. Estimation and Results

As far preliminary stationary analyses, the integration properties of the data are checked by using conventional unit root tests. Because of the likely structural breaks in the series, unit roots were performed using the Phillips-Perron (PP) methodology, as well as the Augmented Dickey Fuller (ADF) statistic. Unlike the ADF test, the PP test takes into account the possibility of trend non

stationarity arising from external shocks and other sources of structural instability, which might have occurred in the country in the period under examination.

Unit root tests for stationary were performed on both levels and first differences for all variables to be used in the basic and extended model. Two different models have been considered while performing tests. The model with constant *(C)* assumes that there are no trends in the levels of the data, such that difference series have zero mean. While the model with a constant *(C)* and linear trend *(T)* is used when linear trends in the levels of the data are observed. The results of the unit root tests are reported in Table-4.1.

Insert Table-4.1 here

As is apparent from the Table-4.1, the test results confirm the acceptance of the null hypothesis of unit root (whether or not trend is included in the regression), at level for each variable on the basis of the two tests (ADF and PP).[5] First differencing of all the variables yields rejection of the null hypothesis on unit root (whether or not trend is included in the regression) for each variable. Based on these test results, it is, therefore, concluded that all series are first difference stationary [i.e. *I(1)*]. This implies that the combination of one or more of these series may exhibit a long run relationship. We, therefore, proceed with cointegration test.

The Engle and Granger (1987) residual based test is one of the most commonly used test for cointegration test. Since it is shown that all variables in equation (3.1) are integrated of order one i.e. *I (1),* we estimate what is known as the first step of Engle-Granger procedure. The results are shown in Table 4.2.

[5] The asymptotic distribution of the PP test statistic is same as the ADF test statistic, therefore, MacKinnon critical values can be used for both tests.

Insert Table-4.2 here

The above estimates reported in Table 4.2 are super consistent, because it has been shown that application of OLS to *I (1)* variables yields estimates that converge to their true values at a faster rates than it would be the case if all stationary variables are used in the model. The long-run coefficients of *GDP* and *REP* both have expected sign and are highly significant. The long run coefficient of *FDI* is positive and statistically significant. However, if and only if, there exists a cointegration, then these will be the valid long run estimates. To check whether the variables in the models are cointegrated a quicker method is to check the Cointegrating Regression Durbin Watson *(CRDW)* statistics, which was found to be 1.794. The critical value for *CRDW* test[6], in our case is (0.511). Since the computed *CRDW* statistics is greater than the critical *CRDW* the null hypothesis of a unit root in the residuals is rejected and thus the series are cointegrated. However, the standard practice of testing the stationarity of residual requires employing the ADF, as recommended by Engle and Granger.

Table-4.3 reports the result of stationary test using Augmented Dickey Fuller (ADF) and Phillips-Perron **(**PP) tests. The results clearly show that the residuals are stationary at levels i.e. *I(0).* Since the variables in the model are *I (1)* and the residuals are *I (0),* hence there exist a valid long run relationship between aggregate imports, *GDP*, *REP*, and *FDI* in Pakistan.

Insert Table-4.3 here

While the Engle-Granger single equation based cointegration test have been used frequently in the literature, it has its shortcomings. The most important is that when there are more than two variables in the model, there can be more than one cointegrating vector. The approach developed

[6] The critical values for *CRDW* test can be found in Maddala (1992), p.607.

by Johansen (1988, 1991) and extended by Johansen and Juselius (1990) is considered superior to the Engle-Granger method. This approach provides a multivariate framework and allows for more than one cointegrating vectors. Johansen and Juselius (1990) have derived two tests for cointegration, namely, the Trace test and the Maximum Eigen value test. The computed Trace and Maximum Eigen value test statistics vis-à-vis their corresponding critical values are presented in Table-4.4.

Insert Table-4.4 here

Starting with the null hypothesis of no cointegration among the variable, trace statistics is above the 5 percent critical value. Hence it rejects the null hypothesis of no cointegration, in favor of general alternatives one cointegrating vector. Turning to the Maximum Eigen value test, the null hypothesis of no cointegration is rejected at 5 percent level of significance in favor of specific alternative, that there is one cointegrating vector. Thus, the results from both of two tests suggest that there exist a stable long run equilibrium relationship of real aggregate import demand with its major determinants such as *REP*, *GDP* and *FDI*.

To test the short run relationship we followed Hendry's (1980) general to specific modeling approach, where we include one lag of dependent and independent variables and one lag of error correction term in our error correction model. After experimenting with the general form of the error correction model, the model that best fit the data is reported in Table 4.5.

Insert Table-4.5 here

The above results show that the coefficient of *FDI* is positive and highly significant. This confirms the positive impact of *FDI* on aggregate imports in the short run. The coefficient of

error term has expected negative sign and is highly significant. The high value of the coefficient of error term suggests that the model converges very quickly to the equilibrium value.

5. Causality Analysis

The direction of causality between *FDI* and imports remain unspecified. One mode of dealing with such an issue is to find out the direction of causality using Granger causality method. The usual Granger causality leads to spurious regression results unless the variables in level are cointegrated. Also Granger causality deals with bivariate regression model. On the other hand, Toda and Yamamoto (1995) procedure uses a modified Wald (*MWALD*) test which can be applied irrespective of order of integration and also deals with multivariate regression model.

The results of Granger causality test based on Toda and Yamamoto procedure are reported in Table 5.1. The values in parentheses are probability values while rests of the estimates are F-statistics. The results of Toda-Yamamoto Causality test show that there is unidirectional causality running from inward *FDI* to aggregate imports in Pakistan.

Insert Table-5.1 here

6. Sensitivity Analysis

This section performs a sensitivity analysis to test the robustness of the results. Levine and Renelt (1992) establish the degree of confidence among the relation between the dependent and explanatory variables. After putting additional variables in the model if coefficient of explanatory variable remain significant and of the same sign then they refer to the result as robust. If the coefficient does not remain significant or if the coefficient changes sign, then the confident in the relationship between variables is less and they refer to the result as fragile.

In our core model relative price (*REP*), income (*GDP*) and inward foreign direct investment (*FDI*) are major determinants of import demand. Table 6.1 reports the results of sensitivity analysis where we have shown the impact of *FDI* variable on import with the inclusion of different relevant variable in the basic model. It is cleared from Table 6.1 that despite inclusion of other relevant variables, the coefficient of the focus variable (*FDI*) remains positive and statistically significant, no matter what combination of additional variables are used in the basic model. Thus, our result supports robust positive relationship between inward *FDI* and aggregate imports in Pakistan.

Insert Table-6.1 here

7. Conclusion and Implications

Over the last few decades the relationship between inward foreign direct investment and aggregate imports have been unresolved and very little is known about the impact of *FDI* on import of the *FDI* recipient country. Whether reviewing theoretical literature or previous empirical studies the relationship between inward *FDI* and imports remain controversial. This study intend to contribute to the existing literature using time series data of Pakistan and paying due attention to the standard econometric techniques. The cointegration tests confirmed the existence of significant positive long run relationship between inward *FDI* and aggregate imports in Pakistan. The error correction model results show that there exist significant positive short run relationship between *FDI* and imports in Pakistan. Further more Toda and Yamamoto causality test confirmed significant positive unidirectional causality running *FDI* to aggregate imports in the country. The sensitivity analysis confirms that the results are robust. The policy implication of this study is that while attracting *FDI* in Pakistan, it is important to consider their import

content in the production process and their finish good that might serve as substitute for import in the country.

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Table 4.1: Stationarity Test Results

Variables	ADF test statistics				PP test statistics			
	I(0)		I(1)		I(0)		I(1)	
	C	C & T	C	C & T	C	C & T	C	C & T
IMP	-0.53	-2.22	-4.51	-4.50	-0.52	-2.35	-5.05	-4.96
GDP	-1.06	-1.94	-3.74	-3.61	-0.99	-2.13	-3.72	-3.59
REP	-0.10	-1.78	-4.43	-4.50	-0.18	-1.93	-4.44	-4.49
FDI	1.98	0.68	-3.33	-3.91	2.06	0.57	-3.31	-3.90
GCF	-1.82	-1.91	-3.09	-3.11	-1.39	-1.05	-3.13	-3.14
ICF	-1.09	-1.56	-4.92	-5.09	-1.12	-1.54	-4.92	-5.09
REM	-1.51	-1.25	-4.90	-4.88	-1.53	-1.29	-4.91	-4.89
MCF	-2.27	-2.22	-5.01	-4.89	-2.35	-2.31	-5.01	-4.89
FER	-0.47	-1.99	-6.11	-6.12	-0.29	-1.93	-6.08	-6.11

Note: The critical values for ADF and PP tests with constant (C) and with constant and trend (C&T) at 1%, 5% and 10% level of significance are -3.711, -2.981, -2.629 and -4.394, -3.612, -3.243 respectively.

Source: Authors' Estimation.

Table 4.2: Long run Determinants of Aggregate Imports.

Variables	Coefficient	t-statistics	Prob.
Constant	5.147	5.226	0.000
GDP	0.572	7.505	0.000
REP	-0.579	-2.410	0.024
FDI	0.153	5.406	0.000
Adj. R^2	0.923	F-statistics	104.485
D.W	1.794	Prob.	0.000

Source: Authors' Estimations

Table 4.3: ADF test for Stationarity of Residual

	Without Trend	With Trend
ADF Test	-4.33	-4.24
PP Test	-4.39	-4.28
1% Critical Value	-3.74	-4.39
5% Critical Value	-2.99	3.61
10% Critical Value	-2.64	-3.24

Source: Authors' Estimations.

Table 4.4: Cointegration Test Results.

Hypothesis No. of CE(s)	Trace statistics	5% critical values	Max. Eigen value statistics	5% critical values
None	79.631	55.245	51.886	30.815
At Most 1	27.745	35.010	20.328	24.252
At Most 2	7.417	18.397	5.203	17.147

Source: Authors' Estimations.

Table 4.5: Results of Error Correction Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.033	0.049	-0.688	0.410
D(IMP(-1))	0.446	0.207	2.156	0.044
D(GDP)	1.074	0.917	1.171	0.256
D(REP)	-1.025	0.297	-3.448	0.003
D(FDI)	0.165	0.047	3.548	0.002
RESID(-1)	-1.536	0.326	-4.709	0.000
Adjusted R-squared	0.598	F-statistic		8.153
Durbin-Watson statistic	1.890	Probability (F-statistic)		0.000

Source: Authors' estimation.

Table 5.1: Causality Test Results

Dependent Variable	Modified Wald – Statistics			
	IMP	**RGDP**	**REP**	**FDI**
IMP	_	5.166 (0.016)	0.122 (0.885)	7.119 (0.005)
GDP	1.478 (0.279)	_	3.674 (0.063)	3.919 (0.036)
REP	0.782 (0.530)	2.348 (0.124)	_	1.068 (0.421)
FDI	2.017 (0.175)	0.994 (0.454)	2.474 (0.133)	_

Note: The lag length for *IMP* is 2, *GDP* is 3, *REP* is 1 and *FDI* is 3 as per Akaike Information Criteria (AIC).
Source: Author's estimations.

Table 6.1: Results of Sensitivity Analysis

Variables	Coeff. of FDI	t-stat. (prob.)	Coeff. of other var.	t-stat. (prob.)	Adjusted R^2	DW stat.	F-stat.
Basic model	0.15	5.41 (0.00)	…..	…..	0.92	1.79	104.49
Model 2 GCF	0.11	3.20 (0.00)	2.40	2.11 (0.04)	0.93	0.71	91.27
Model 3 ICF INS	0.14	5.14 (0.00)	5.21 0.10	2.19 (0.03) 1.79 (0.08)	0.93	1.93	71.29
Model 3 ICF REM	0.13	4.44 (0.00)	3.48 2.45	2.12 (0.04) 1.96 (0.06)	0.93	1.89	73.22
Model 4 MCF	0.15	5.56 (0.00)	5.04	1.75 (0.12)	0.92	1.95	84.24
Model 5 Log of FER	0.15	5.26 (0.00)	0.02	0.48 (0.63)	0.93	1.84	75.82

Source: Authors' Estimations.